CHALLENGES IN PREDICTING LONG-TERM PERFORMANCE OF CEMENTITIOUS MATERIALS IN NUCLEAR WASTE APPLICATIONS

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ABSTRACT

Cementitious materials are used in nuclear waste management systems as waste forms, grouts, and containment structures. Each of these systems requires the cementitious material to provide containment and isolation of residual radionuclides from the environment for hundreds to thousands of years. Over these time scales, the cementitious materials are expected to serve physical, chemical and hydraulic isolation functions. Performance assessments are quantitative models, developed with simplifying assumptions, intended to project the long-term release of radionuclides from these systems including evaluation of uncertainties. Fundamental mechanisms and aging processes need to be represented to the greatest extent practical to understand and credit the actual expected performance of the integrated engineered system where the cementitious expected to form primary barriers. An overview of the roles of cementitious materials in nuclear waste applications and the challenges in evaluating long-term performance is presented.

Keywords
Performance assessment, reactive transport, degradation, cementitious materials.